CARL ZEISS, JENA.

New Stereoscope

Stereo-diapositive Views

Stereo-Micrometer

1903.

New Stereoscope

for the examination of Stereoscopic Views of ordinary size.

CARL ZEISS
OPTISCHE WERKSTAETTE
JENA.

Stereo-diapositive Views and Stereo-Micrometers

to demonstrate some fresh applications of Stereoscopy.

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For **Summary** and **List of Prices** see last page.

A. New Stereoscope (Fig. 1)

for examining Stereoscopic Views of ordinary size

(maximum distance between pictures 80 mm [$3^1/_8$ in.]).

In the present stereoscope we offer to those who are interested in our binocular telescopes with increased objective distance[1]), our stereo-telemeter[2]), and the stereo-comparator[3]), and to all those who take an interest in stereoscopy generally, a handy instrument with which the stereoscopic views accompanying the prospectus relating to above instruments, and the stereoscopic views mentioned below, may be examined in a much more thorough manner than is possible with any of the ordinary instruments of the kind on the market.

The apparatus (Fig. 1) differs from most of the simple apparatus now on the market by possessing the advantageous feature that it can be **altered** at will, within wide limits, with regard to the vertical interval between the eye-pieces

[1]) See Prospectus relating to Zeiss Field-Glasses and portable Stereo-Telescopes, as also Prospectus relating to new Binocular Stand Telescopes.

[2]) See Prospectus relating to Stereo-Telemeters.

[3]) See C. PULFRICH: "Über neuere Anwendungen der Stereoskopie und über einen hierfür bestimmten Stereo-Komparator" in the "Ztschr. f. Instrumentenkunde", vol. XXII, numbers 3, 5, 6 and 8, 1902. A prospectus relating to Stereo-comparators is in preparation.

and the stereoscopic view, for the purpose of **adaptation to the observer's power of vision,** as also with regard to the distance between the two lenses, for the purpose of **adaptation to the ocular distance of the observer and the distance between the stereoscopic views.** The adjustability of the ocular distance is of special importance for the reason that it is thereby rendered possible to unite the views in stereoscopic vision **without the least constraint** to the observer.

The adaptation of the instrument to the observer's power of vision is effected by first loosening

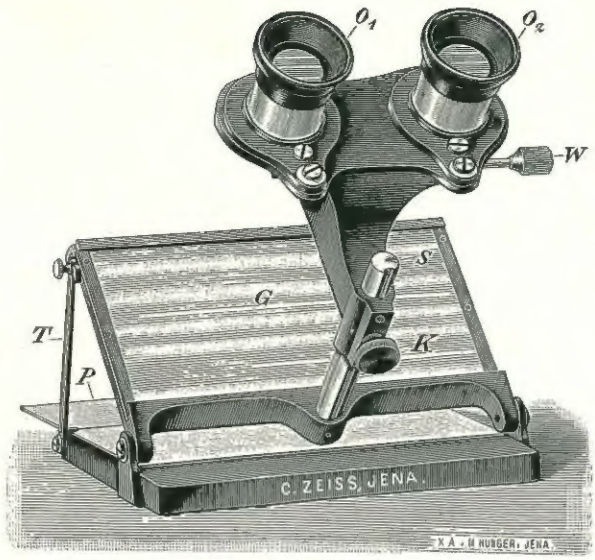


Fig. 1. New Stereoscope ($^1/_8$ full size).

the clamping screw *K* and, holding it, to move the carrier of the two eye-prieces along the cylindrical stem *S* until the views are seen clearly. When in this position, the clamping screw *K* is tightened again.

The adjustment for ocular distance is effected by revolving the screw head *W*, situated at the side of the right eye-piece. A divided scale for the ocular distance is not provided, this being not merely a question of the observer's ocular distance, but also of the distance between the pair of stereoscope pictures which, as is well known, varies considerably.

(ref Gruber Photogrammetria page 264)

It will, therefore, generally happen that the same observer will find it necessary to make a fresh adjustment (by revolving screw *W*) for each fresh pair of pictures, as will likewise any fresh observer for the same stereoscopic view.

The stereoscope is **equally applicable to stereoscopic views on paper, as to negatives and diapositives on glass.** The illumination by transmitted light is effected by means of the white folding screen *P*, shown in the illustration, and by a ground-glass plate *G*, inserted into the stage proper. A stay *T*, fitted at the side of the base plate and provided with a catch pin, maintains the entire stereoscope in position at an inclination of 45°, as required for observation.

Owing to the fact of the plate which holds the stereoscopic view being freely accessible from all sides, the **examination of the stereoscopic views is not dependent on their external dimensions.** Facilities are given at the same time for adjusting by hand single views or negatives which have not yet been combined into a regular stereoscopic pair; in such case it would seem advisable to place the stereoscope so as to have the stage horizontal.

Finally, the entire upper portion with the two eye-pieces can be detached from the apparatus by loosening the clamping screw *K*, when it may be held to the eyes in the manner of a pair of stereoscopic spectacles, the object being to facilitate the stereoscopic **examination of stereoscopic views printed in books,** which for this or any other reason it would be impossible to place upon the stage of the stereoscope.

Price: Marks 40.—. *Code-word:* ***Stereoscop.***

B. Stereo-Diapositives.

A collection of stereoscopic views designed to demonstrate, either by themselves or in conjunction with the Stereo-Micrometer described under C,

the method of stereoscopic observation and stereoscopic determination of distances

as applied to

photogrammetric, military, astronomical and other purposes.

With a view to uniform illumination the back of each diapositive view is covered by a ground-glass plate. The photographic stratum is situated between the glass plates and is thus completely protected against injury from outside.

As long as our present supply lasts, we shall be pleased to supply **reproductions on paper** of any of the following stereoscopic views, **free** on application.

1. Test-Plate for stereoscopic vision.

Bibliography: C. PULFRICH in the "Zeitschrift für Instrumentenkunde", vol. XXI, 1901, p. 249.

The plate contains a number of geometrical figures in connection with which all so-called quasi-stereoscopic effects — perspective, &c. — are intentionally omitted, so that their swarm-like order, their relative positions in depth of space, becomes apparent only to those who possess the power of stereoscopic vision. For the reason that the

differences of depth between individual figures are arranged in varying order as to magnitude and that the variations extend to the extreme, barely perceptible, limits of the power of differentiating depth, the plate appears eminently suitable, in respect of both quality and quantity, as a **test object** for judging the extent of individual power of stereoscopic vision; and this is a matter of great interest, not only to purchasers of our Stereo-Telemeters, but also from the point of view of the scientist generally.

It proves, in addition, a valuable **means of training** both eyes in equal application and of developing in a systematic manner the power of conception of dimensions gained by simultaneous vision with both eyes, particularly where this power has been lost, more or less, owing to the exhaustive effect of observation with one eye only.

Some of the figures of the plate also demonstrate the utility of stereoscopic observation for the purpose of comparison of stellar photographs or of scales of dimensions.

A detailed explanation of the plate and of its various figures is contained in the essay mentioned above, which accompanies each plate.

Price: M. 7.50. *Code-word: **Stereohomo.***

2. The same plate reduced to $^4/_5$, designed primarily as a test object for children.

The ordinary stereoscopic views on the market are almost exclusively adapted for the ocular distance of adults (58—72 mm) and the viewing of them by children cannot, obviously, be recommended, on account of the divergence of the axes of the eyes thereby entailed and the resulting strain — particularly with short-sighted children — notwithstanding that in the present form of stereoscope this disadvantage can be partially counteracted by adjusting the eye-pieces to their smallest possible distance from each other. Stereoscopic views with more than 65 mm between pictures should only be shown to children with the greatest caution, but under no circumstances whatever in one of the ordinary stereoscopes without means of adjustment for distance between lenses.

Price: M. 7.50. *Code-word: **Stereopuer.***

3. Tele-stereoscopic landscape with stereoscopic scale suspended in the air over the landscape, to demonstrate the effect of our Stereo-Telemeter (Fig. 2).

The scale suspended in the air over the landscape (the environs of Jena and the Saale Valley) consists of three zigzag lines of marks, individually slightly ascending and bearing in a straight line into space.

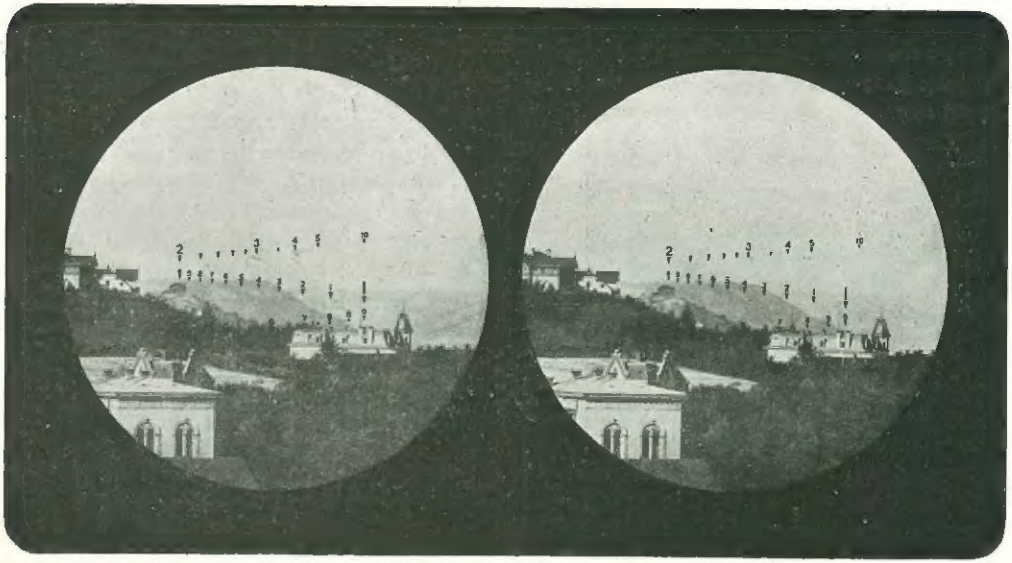


Fig. 2. Tele-stereoscopic landscape with stereoscopic scale suspended in the air over the landscape to demonstrate the effect of our Stereo-Telemeters.

The first line, in the foreground of the landscape, comprises the distances from 450 to 1000 metres; the second, crossing the valley between the villa on the right and the conical hill, from 1000 to 2000 metres; and the third line from 2000 to 10000 metres. The scale is derived from one of the earlier experimental instruments, the relief effect obtained in the view being almost identical with that of a Stereo-Telemeter having a telescopic magnifying power of about 13 diameters and a working base of 78 cm.

With the Stereo-Telemeter itself the manner of determining the distance is by holding the instrument so that the scale is suspended free in the air above the object to be ranged on, but passing as close above it as possible, similarly to the lower line of marks above the villa on the right of the picture, and then noting the place where the **highest point of the object ranges into one or other of the lines of marks.**

In the present view the scale is immovably combined with the picture of the landscape. In order to test the applicability of the stereoscopic method of range-finding by the various objects included in the landscape, we recommend the use of the Stereo-Micrometer described under C.

For further details please refer to our prospectus relating to Stereo-Telemeters and the additional literature quoted therein.

Price: M. 7.50. *Code-word:* ***Distico.***

4. Tele-stereoscopic Cloud View, taken with objectives of 24 cm focus and 10 m objective distance, directly facing the sun.

In the stereoscopic view the sun appears a considerable distance **behind** the clouds.

With regard to this, and the stereoscopic views 5 and 6, see C. PULFRICH "Über neuere Anwendungen der Stereoskopie und über einen hierfür bestimmten Stereo-Komparator" in the "Zeitschr. f. Instrumentenkunde" vol. XXII, 1902, p. 71.

Price: M. 7.50. *Code-word:* ***Stereonube.***

5. Stereo-photogrammetric landscape in the Dolomites, taken by Colonel VON HÜBL, Military Geographi-

cal Institute, Vienna, with an objective of 24 cm focus and an objective distance of 45 m.

With reference to the same see C. PULFRICH, loc. cit., p. 68.

The originals reduced to the size of stereoscopic views measure 18 × 24 cm. The borders on each view, with the series of marks seen therein and the vertical line on each of the pictures, serve specially for photogrammetric purposes. In accordance with the conditions obtaining on the occasion of the experiment — the optical axes being horizontal and at right angles to the base line — the marks correspond to very distant objects and therefore appear farthest away in the stereoscopic view.

Price: M. 7.50. *Code-word:* ***Stereodolo.***

6. Saturn in the Constellation of Ophincus, arranged for stereoscopic observation after photographs by Professor M. WOLF, of Heidelberg (Fig. 3).

See C. PULFRICH, loc. cit., p. 230.

The photographs were taken on the 9th and 10th June, 1899, with an objective having an aperture of 159 mm and a focus of 806.7 mm.

The duration of exposure was $1^1/_2$ and 2 hours resp. The mean time of exposure was in both cases shortly before midnight.

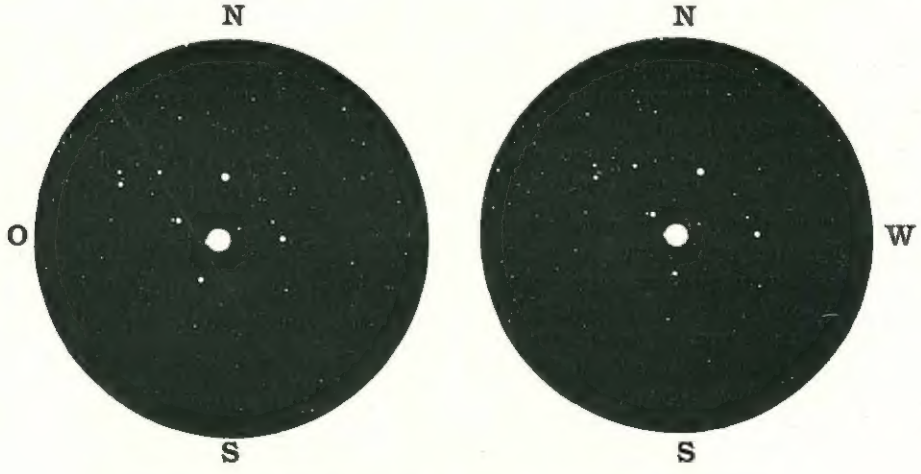
As base line for stereoscopic observation is to be assumed the distance covered by the earth in one day of its migration round the sun, less the distance covered in the same time by Saturn, i. e., a base of $2.56 - 0.83 = 1.73$ millions of kilometres. As apparent from the stereoscopic view, Saturn — distant from the earth 1260 millions of kilometres — with this base line detaches itself from its background, the firmament of fixed stars, and appears with two of his satellites hovering independently in space in advance of the infinity plane of the fixed stars.

In the present reproduction WOLF's originals have been enlarged $2^1/_2$ times before being arranged as a pair of stereoscopic views. The circles of Saturn appear neither on the plate nor in the stereoscopic view, having been completely overradiated by the brilliancy of the planet by reason of the period of exposure extending over nearly two hours. The large diameter of the disk, too, is due to this overradiation and does not supply a clue for the estimation of Saturn's diameter. On a second plate exposed by Professor WOLF at the same time, but with a different objective, all the images of the stars are considerably smaller, and the satellite clinging to the left of Saturn appears as if separated by a wide

Fig. 3.

Saturn in the Constellation of Ophincus

on June 10th, 1899 on June 9th, 1899



arranged after photographs by Professor M. WOLF, of HEIDELBERG.

interval. On these plates, too, the elongated shape of the planet and the satellites — due to their own motion during the exposure period — is clearly recognisable.

Price: M. 7.50. *Code-word:* ***Stereosatu.***

7. Stereoscopic View of the Moon, after original photographs by Messrs. LOEWY and PUISEUX, of Paris.

The originals, taken with the "équatorial coudé" ($f = 18.05$ m), have a diameter of about 16 cm.

Date when taken: 1900, Febry. 7 and 1896, April 20.
Mean time, Paris: $6^h\ 15^m\ 30^s$ and $8^h\ 18^m\ 3^s$
Duration of Exposure: 0.7^s 1^s.

In the present reduction the images of the moon correspond to the production of an objective of 8.16 m focus. The view through the stereoscope corresponds to a telescopic magnification of 50 diameters.

The base line for stereoscopic observation of the moon necessitated by its libration — in the present instance approximately 14° — amounts to 95000 km, or exactly one quarter of the moon's distance (380000 km). The moon thus appears in the stereoscope as it would to a giant with 95000 km ocular distance, when using two telescopes of × 50 magnifying power and arranged with their axes converging (at 14°), or, in other words, as a model of the moon, reduced $1^1/_2$ milliard times, i. e., a globe of 2.4 mm diameter, would appear to an observer, having 65 mm ocular distance, at a distance of $^1/_4$ m, if viewed through two suitably converging microscopes of × 50 magnification. The accomodation necessitated in the latter case (the adjustment of the microscopes) for the different parts of the globular surface is disregarded in this comparison as immaterial.

With regard to the stereoscopic examination of the moon by means of the Stereo-Comparator, see a lecture delivered before the Astronomical Meeting in Göttingen on Aug. 5, 1902, by C. PULFRICH. A copy of this lecture, which was published in the "Vierteljahrsschrift der Astronomischen Gesellschaft", vol. 37, 1902, No. 3, p. 211, is supplied with each specimen of the view.

Price: M. 7.50. *Code-word:* ***Stereoluna.***

c. Stereo-Micrometer (Fig. 4)

is placed on the stereoscopic view (paper or diapositive) lying on the stereoscope stage and serves, in conjunction with the stereoscopic views detailed under *B*, for

the purpose of demonstrating the applicability of the stereoscopic method of measurement (a so-called travelling mark)

to the various branches of science involved and for

a study of the character and advantages of the stereoscopic method of measurement as compared to the monocular system of ranging.

The instrument consists of a metal frame *R*, with two rectangular openings of the size of an ordinary stereoscopic view, which is simply put over the stereoscopic view (paper or diapositive) that happens to be on the stereoscope stage, and is held in position by the ledge at the bottom of the stage and by the two fittings (*aa*) on the lower edge of the frame.

In order to prevent injury to a paper view by the movable points m_1 and m_2 of the micrometer mechanism, it is advisable first of all to cover the paper view with the glass plate supplied with the micrometer appliance before laying on the latter. Diapositives (see under *B*) do not require such protection.

The micrometer appliance proper is attached to the upper edge of the frame. It consists of the principal slide *A*, which is freely movable in the horizontal direction (being held by the small head *K*) to the extent of several centi-

metres, and of a second slide *B*, fitted upon the former, the horizontal movement of which is also effected by means of the fine-movement screw *S*, which is provided with a drum bearing a divided scale. The so-called travelling mark, which serves for the purpose of measurement, consists of two metal strips, terminating in a point and bent back so that their lower extremities are in closest proximity to the stereoscopic view. One of the strips, m_1, is attached to the principal slide *A*, the other, m_2, to slide *B*. This arrangement gives facilities for micrometrically varying the interval between the two strips m_1 and m_2 at will, as also for moving both together laterally across the stereoscopic

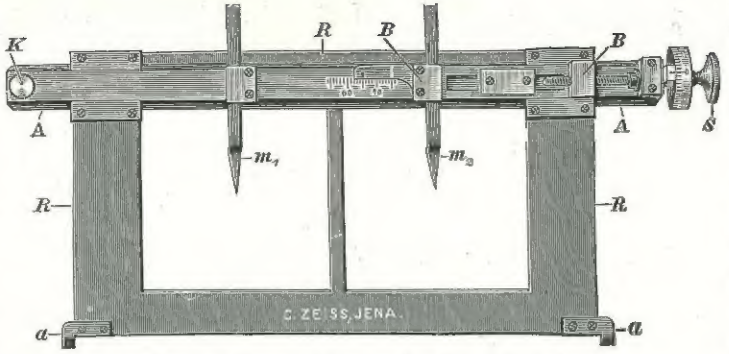


Fig. 4. Stereo-Micrometer ($^1/_3$ full size).

view without altering the space between them.

In order to facilitate vertical variation of the measuring mark, more especially for the purpose of accurate adjustment of the elevation of the two marks in relation to the stereoscopic view below, each of the metal strips m_1 and m_2 independently can be moved in vertical direction by hand.

The adjustment of the travelling mark in relation to the relief picture of the landscape, or any other object the distance of which is to be ascertained, in such manner that the mark appears suspended **above** or **at the side** of the object — a matter of great importance in the stereoscopic method of measurement —

can thus be readily effected by means of the arrangements described.

The millimetric division (52—75 mm) in the centre of the principal slide and the divisions on the drum of the micrometer screw *S* (0.5 mm range), which records hundredths of a millimetre, serve to regulate the interval between the points of the marks.

The Stereo-Micrometer described is only intended for purposes of demonstration, but not for actual measurements. The fact of the two marks and the stereoscopic views not lying in exactly the same plane would, whenever the ocular distance of the observer does not correspond with the interval between the two points m_1 and m_2, give rise to such parallactic disturbances as to cause observers with varying ocular distances to see mark and object in different relative distance from each other.

Price: Marks 40.—. *Code-word:* ***Stereomess.***

Summary:

	Price Marks	Code-word
New Stereoscope	40.—.	*Stereoskop.*
Stereo-Diapositives		
1. **Test Plate**	7.50.	*Stereohomo.*
2. **The same for children**	7.50.	*Stereopuer.*
3. **Landscape with scale**	7.50.	*Distico.*
4. **Tele-stereoscopic Cloud View**	7.50.	*Stereonube.*
5. **Stereo-photogrammetric landscape in the Dolomites**	7.50.	*Stereodolo.*
6. **View of Saturn**	7.50.	*Stereosatu.*
7. **View of the Moon**	7.50.	*Stereoluna.*
The whole	52.50.	*Stereodia.*
Stereoscope with all the Diapositives	92.50.	*Stereotipo.*
Stereo-Micrometer	40.—.	*Stereomess.*
All the articles enumerated in this prospectus	132.50.	*Stereorama.*

The prices quoted are strictly net cash, without deduction whatever, against immediate payment on consignment in Jena.

Telegraphic Address: **Zeisswerk Jena.**

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